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Rubber Research Institute of Ceylon

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NOTICES

DARTONFIELD ESTATE — VISITORS' DAY

The services of technical officers are available to visitors on the second Wednesday in each month ; the estate superintendent is available every Wednesday. Visitors are requested to arrive on the estate not later than 9-30 a.m.

Visitors will be welcomed at the station on other days provided an appointment has been made in advance.

Dartonfield Estate is situated about 3½ miles from the main Matugama-Agalawatta Road, the turn-off being near culvert No. 14/10. The distance from Colombo is approximately 47 miles.

PUBLICATIONS

Rubber Research Institute publications comprising Annual Reports, Quarterly Circulars and occasional Bulletins and Advisory Circulars are available without charge to the Proprietors (resident in Ceylon), Superintendents and Local Agents of rubber estates in Ceylon over 10 acres in extent. Forms of application can be supplied to the Superintendents of large estates for the use of their assistants.

It will be appreciated if subscribers will return any back publications which are of no use to them.

ADVISORY CIRCULARS

The undernoted Circulars may be obtained on application at 30 cents per copy. Future issues in the series will be sent free of charge to estates registered for the receipt of our publications :—

(1) Notes on Budgrafting Procedure (Revised May, 1952)
(5) Straining box for latex (January, 1940)
(6) Notes on the care of Budded Trees of Clone Tjirandji 1 with special reference to Wind Damage (Sept. 1938).
(12) Warm Air Drying House for Crepe Rubber (Reprinted 1952).
(17) Tapping Young Budded Trees—Prevention of Precoagulation (2nd Supplement) (Revised March, 1949).
(19) Density of Planting and Thinning out (December, 1942).
(21) The Control of Bark Rot and Canker (Revised February, 1952).
(23) Uniformity in the Nomenclature of Clones & Clonal Seedlings (December, 1944).
(28) Oidium Leaf Disease (November, 1950) (superseding Circular No. 22).
(31) Root Disease in Replanted Areas (October, 1951) (superseding Circular No. 10).
(32) Crown budding for Oidium Resistance (October, 1951).
(33) Mechanical Felling of Rubber Trees (February, 1952).
(34) Tapping Systems (February, 1952) (superseding Circular No: 17)
(35) Notes on Rubber Seedling Nurseries (February, 1952) (superseding Circular No. 3).
(36) Contour Lining, Holing and Filling, Cutting of Platforms, Trenches and Drains (superseding Circular No. 4).
(37) Manuring of Rubber (superseding Circular No. 30).
(38) Planting and After Care of Budded Stumps and Stumped Budgrafts (superseding Circular No. 8).

THE BLEACHING OF BUDDED RUBBER LATEX BY RPA.3—A PROGRESS REPORT FOR CEYLON

By

E. J. RISDON

*Chemist and the Staff of the Chemical Dept.**

1. Introduction.—In 1950 the agents of the R.R.I. of Malaya applied for a patent (8) in the United Kingdom for a process whereby the yellow colouring matter of certain latex could be destroyed by a range of organic chemicals including xylyl mercaptan, the active ingredient of Messrs. E. I. Du Pont de Nemours' RPA.3. Further details of this process were released to the R.R.I. of Ceylon early in 1951 but until the re-opening of the Chemical Dept. late in April 1951 little experimental work could be carried out on the subject. Emulsification of the RPA.3 in water prior to its addition to latex is necessary, and the preferred emulsifying agent was ammonium oleate. In a later process of emulsification the R.R.I.M. suggested the preparation of the oleate in situ in the presence of excess ammonia in the course of making the emulsion. Emulsification of RPA.3 with oleate never reached the commercial stage in Ceylon in 1951 largely because the R.R.I.C. was unable to attempt commercial scale emulsification (3, 5). Whereas the R.R.I.M. had at its disposal a Hurrell Homogeniser, only a rather old Premier Colloid Mill was available at the R.R.I.C. and this appeared capable of producing only a somewhat unstable emulsion at a low rate of production. However, sufficient emulsion was produced to give the laboratory staff some experience in the process and in the handling of the latex and rubber, but limited trials at outside Estates were not completely successful for reasons not entirely clear at the time.

The suggestion, emanating it is believed from Messrs. Du Pont de Nemours in conjunction with the R.R.I.M., that the addition of Duponol OS instead of ammonium oleate to RPA.3 would permit ready emulsification without the use of complex machinery opened up the possibility of the commercial utilisation of the process in Ceylon. The first leaflet issued by the R.R.I.C. (3) on a restricted publication basis described preliminary experiments designed to give Estates sufficient data to start their own experiments. Since that date a large number of the variables involved have been investigated in some detail both in Malaya and Ceylon, and comparatively recently (1952) the R.R.I.C. sent out a questionnaire on this subject to various Agency Houses and Estates with a view to obtaining the opinions of the latter on the process and of advising them directly of the opinions (at that time) of the R.R.I.C. on the comments made.

2. Commercial Utilisation in Ceylon.—By arrangement between the Boards of the R.R.I. of Malaya and of the R.R.I. of Ceylon, any rubber producer in Ceylon may use the process, originally patented by the R.R.I.M. simply by applying to the Director of the R.R.I.C. for permission. This permission is normally granted extremely rapidly, pending final ratification by Malaya. So far as is known, no application has been refused. The necessary raw materials, *e.g.* RPA.3 and Duponol OS, are imported into Ceylon by Messrs. Du Pont de Nemours' Colombo Agents, Messrs. Mackwoods Ltd.

*S. Natesan, formerly Research Assistant and M. T. Veerabangsa.

The importers issue advisory leaflets and price lists at intervals and Estates in Ceylon have been advised to obtain the former, which are normally submitted to the R.R.I.C. for comment before circulation. The R.R.I.C. does not, of course, undertake to guarantee the accuracy or universal applicability of Messrs. Mackwoods circulars.

All inquiries for information on the health hazards involved in the use of RPA.3 and Duponol OS on Estates are normally referred by the R.R.I.C. to the importers.

3. **Emulsification of RPA.3.**—In Malaya, the R.R.I.M. marketed through a distributing agent the ready made emulsion containing oleate under the name of Emulsion A (1, 2). More recently, the Malayan distributing agent has supplied a self emulsifying form of RPA.3 containing Duponol OS and sold under the name of Emulsion A Concentrate (2). The efficiency of Duponol OS for the emulsification of RPA. 3 in water and the stability of the resultant emulsion depends upon the quality of the water, but nevertheless there appeared at the R.R.I.C. to be some latitude in the permissible concentration of Duponol OS, provided the emulsion is well shaken in preparation *e.g.* preferably in a stoppered bottle (hand stirring does not usually produce such a stable emulsion). Normally 1 part by weight of Duponol OS is added to every 20 parts by weight of RPA.3 (3, 4, 5), and of 56 Estates which have given the R.R.I.C. written comments on the process only 2 considered that a change in this ratio is desirable and these appeared to be basing their opinions on results where treatments and days are confounded. Increased proportions of Duponol OS have not been generally advised unless essential as there was no reliable evidence in Ceylon to suggest that increased amounts of Duponol OS would prevent discolouration of the finished product. However, in Malaya, 1 part of Duponol is used to every 9 parts of RPA.3 in Emulsion A Concentrate and the subject is now being reinvestigated in Ceylon. The preliminary evidence is inconclusive so far.

Ready mixed RPA.3 and Duponol OS in the form, for example, of Emulsion A Concentrate is not available (Dec. 1952) in Ceylon in production quantities. Since the R.R.I.M. do not recommend (2) the storage of the Concentrate beyond 2 months, it seems unnecessary at this stage to encourage the provision of the Concentrate in Ceylon.

Standard RPA.3 emulsion containing approximately 20 parts by weight of RPA. 3, 1 part of Duponol OS and 80 parts of water has been found to be capable of bleaching latex quite satisfactorily even after 2 or more weeks storage, provided the emulsion is well shaken before addition to the latex. Estates have been advised (3, 4) not to store emulsion as the latter may not be properly shaken before addition to the latex. Examples of difficulties attributed to this cause are known. The R.R.I.M. advise (2) the use of the emulsion on the day of preparation.

4. **Concentration of RPA. 3.**—The bleaching action of RPA.3 may, in theory, be employed commercially to improve the overall colour of the finished product without changing the % fraction or to decrease the % fraction without improving the colour, or a suitable combination of the two may be followed. Originally (3), the R.R.I.C. advised Estates to test for themselves the concentration best suited to their conditions and warned Estates about the possible non-permanence of the bleached material. The R.R.I.M. advised an upper limit of 2 lbs. of RPA. 3 per 1,000 lbs. dry rubber content on the grounds of softness and this recommendation was passed on to Estates in Ceylon (3).

Data on this subject with reference to Ceylon sole crepe is to be found in the experimental section of this article. Early experiments at Dartonfield on the laboratory scale carried out to investigate certain variables suggested that although 2 lbs. of RPA. 3 per 1,000 lbs. dry rubber in latex frequently gave a white sheet this did not always hold its colour on storage, especially when made for convenience and ease of handling without a fraction. There is evidence which suggests marked differences in clonal response to RPA.3 and in some cases, with comparatively high concentrations of RPA.3 poor colour may be obtained on lamination. Presumably different areas may require different treatments (the bulking of latex should therefore only be carried out after proper trials), and excessive RPA. 3 is definitely undesirable. Recently (2) the R.R.I.M. noted that one quarter to one tenth of the previous concentration of RPA.3 is often adequate. Substances such as RPA. 3 and Pepton 22 which can plasticise natural rubber and bleach latex carry out the former function by increasing the effect of oxidative breakdown during mastication (11, 12) and it appears that RPA.3 may interfere (12) with the storage hardening (Mooney test) usually observed with crepe. Data (modulus at 50% elongation) by the London Advisory Committee, on the storage of Ceylon sole crepe at various temperatures is given in the experimental section.

There is therefore considerable evidence in favour of the use of the minimum proportion of RPA. 3 and at the Nivitigalakele Division (all budded rubber) of the R.R.I.C. the proportion of RPA.3 is never more than 16 ozs. per 1,000 lbs. dry rubber. From information supplied by commercial Estates the preferred concentration would at present appear to fall between 2—20 ozs. of RPA.3 per 1,000 lbs. dry rubber. But no hard and fast rules on this point are laid down as the conditions *e.g.* degree of improvement required, clones available, weather, tapping systems and quality of water etc. are not necessarily constant from one Estate to the next. Estates have been warned (3, 4, 5) that tests to determine the concentration of RPA.3 best suited to their conditions (and this may well be considerably below 10 ozs. per 1,000 lbs. dry rubber) should be carried out with great care and preferably with relatively small portions of latex before proceeding to use a whole day's output. The objection that small amounts do not always reflect the performance of a full scale test due to ' scaling up ' factors is not necessarily considered sufficient justification for using a whole day's output for each test concentration whereby effects due to days (weather, clones, tapping systems) are confounded with those due to treatments, nor does it necessarily justify running the test concentration for about a week or so thereby risking the production of material which ' lands ' the shipper and possibly the Estate with heavy claims due to, say, discolouration on storage.

5. Fraction Taken.—As noted above the bleaching properties of RPA.3 may in theory be employed commercially either to reduce the % of low grade fraction maintaining approximately the same overall appearance in the product, or to improve the product with approximately the same % of fraction or by a suitable combination of the two. The ideal of entirely eliminating the fraction (*e.g.* to make, say, blanket crepe just up to No. 1 grade) by the use of RPA.3 may be practicable in certain cases but does not seem universally applicable. Estates have been advised (4) to be wary of this process and that those wishing to use it should carefully check *inter alia* the colour and colour holding behaviour of their product on storage against that of proper control samples over a suitable period of time.

The fraction may normally be taken before or after addition of the RPA.3. Of 50 Estates which have supplied details on this point, 30 take a fraction after

the addition of RPA.3, 13 before the addition and 7 take no fraction. A number of the last group encountered difficulties. At the R.R.I.C. a number of the small experiments have to be made without a fraction because of practical difficulties, but at Nivitigalakele Division on a commercial scale a fraction of about 7—14% is taken.

6. Discolouration of Bleached Crepe.—Certain Colombo Shippers suspected (4) that a limited number of complaints with regard to the discolouration of high grade blanket and sole crepes may have been due to the introduction of some new process such as the use of RPA.3, or rather to the faulty application of the process on Estates. A similar scare in regard to Ceylon blanket crepe arose in 1949, that is before the introduction of RPA.3 bleaching agent, and the R.R.I.C. investigated the matter in some detail. The principal conclusions of a leaflet (7) distributed by the R.R.I.C. at that time are that discolouration of one sort or another could arise through the use of (*a*) insufficient or deteriorated bisulphite (*b*) excessive Teepol (*c*) stale latex—that is latex which is not coagulated until two or three days after collection (*d*) inadequate milling and washing giving rise *inter alia*, to microbiological activity and of (*e*) worn rollers causing balling up of the edge of the lace which discolours when the thick spots are drying. Earlier correspondence of the R.R.I.C. suggests cases of discolouration due to exposure to sunlight as well as to too slow drying.

As there is ample evidence to show that rubber containing RPA.3 will discolour on storage or give a poor initial colour just as readily as rubber without RPA.3 if the manufacturing conditions are not properly controlled, it is proposed to discuss in this section certain of the more important process variables. Attention has been drawn elsewhere (3, 4) to the importance of the quantity of bisulphite used, of the quality of water used and of the processes employed in wet weather and these will therefore be mentioned first.

(*a*) Quality of Bisulphite: Although the copy of the original patent application (8) available to the R.R.I.C. did not seem to emphasise the importance of bisulphite, tests (3, 4, 5) showed that at Dartonfield 0% up to .3% bisulphite on the d.r.c. did not give such a good colour as .5%, which, in recent tests (4) has not been quite as good as .7% to .9%. Excess bisulphite is believed (10 *et al*) to be objectionable on the grounds that it retards the drying rate, increasing the risk of mould and of discolouration due to too long exposure to heat and light. Since the R.R.I.C. is aware of comparatively recent cases of discolouration due to omission of part or all of the bisulphite and the use of insufficient or deteriorated bisulphite, Estates have been advised (4) that (*a*) they may find it desirable to increase slightly the weight of bisulphite particularly if it is likely that partially deteriorated bisulphite may be used undetected, (*b*) if bisulphite is received in large containers it may be advantageous to repack it on first opening into dry, well sealed smaller containers, (*c*) badly deteriorated bisulphite should be discarded for this purpose, although it might be suitable as a field anticoagulant and that (*d*) under no circumstances should bisulphite be left lying about outside its corked or sealed containers, which should only be opened for the minimum time just before addition of the chemical to latex. The proportion of bisulphite used with RPA.3 at 53 Estates in Ceylon is shown in the table below :—

0z. of Bisulphite/100 lbs. d.r.c.	No. of Estates	0z. Bisulphite/100 lbs. d.r.c.	No. of Estates
5—6	7	9	3
7	5	10	5
8	30	12 and over	3

(*b*) Quality of the water: The importance of the quality of the water, particularly the 'standardisation' water has also been fully emphasised previously (3, 4, 5). Of 56 Estates which supplied information on this point only 4 did not standardise their latex by dilution with water; the preferred 'standardisation' figure appeared to be 2 lbs. d.r.c./gallon, although 10 Estates standardised to 2½ lbs. and 3 to 1½ lbs./gallon. All Estates whose bleached product is not satisfactory in respect of colour or of colour holding qualities have been advised (3, 4) to consider running tests comparing 'standardisation' with their factory water to no 'standardisation' and to 'standardisation' with clean rain water. This seems important as there is evidence to show that ionic iron can produce a discolouration (3, 5), particularly in the presence of ammonia. The provision of filters to remove algae and decomposing vegetable matter is not apparently generally necessary; and it will be remembered that the total solids content of many Estate waters is quite low (6).

(*c*) Wet weather: Experiments at Dartonfield and elsewhere have suggested that abnormal discolouration of the laminated bleached product can at times occur during wet weather. By no means all estates have observed this difficulty and some find that with RPA.3 the discolouration observed in wet weather is less than is found without RPA.3. On general grounds it is expected that tannins with other organic water-extractable material, dust, dirt and microorganisms, *e.g.* bacteria, washed down into the cups could produce discolouration and perhaps interfere with the action of the bisulphite and or of the bleaching agent. Interpretation of data from very small scale experiments is difficult due to the interference of precoagulation etc. Nevertheless experiments to date have led to the following tentative comments *vis a vis* bad weather conditions at least with respect to the latex from certain areas of Dartonfield.

1. Early addition of part of the bisulphite *e.g.* at the collecting centre has never been disadvantageous and has occasionally been advantageous. [The choice of anti-coagulants is discussed under (*e*) below].

2. Fractional coagulation whether intentionally in the factory or accidentally in the cup normally reduced any tendency to discolouration.

3. Dirty cups or wet cups in the absence or presence of scrap in the cups have so far proved definitely undesirable. Clean dry cups also appeared to reduce the tendency to precoagulation and it may in some cases be worthwhile issuing 2 cups per tree, leaving the unused cup inverted to dry out free from scrap.

4. Addition of aqueous bark extract to latex can produce a discolouration which seems more intense the higher the concentration of RPA.3 at least over certain limits.

Estates have been advised to test whether the bleaching process can be used in wet weather *e.g.* from conditions giving damp cups to partial washouts. If the answer is negative further experiments with varied proportions (or types) of anticoagulants, RPA.3 etc. are necessary. Attention may also have to be given to the suitability of the factory water at the various seasons and to the fact that factory processes may be unduly hurried or imperfectly carried out with the latex in wet weather, and there is, at present, no evidence to suggest that the labour may be permitted to skimp or hurry any of the usual mixing, straining and fractional coagulation processes in wet weather.

(*d*) Storage of RPA.3 : According to the manufacturers RPA.3 is packed in specially lined drums. Nevertheless one Estate has found that the contents had discoloured presumably as a result of minor imperfections in the linings arising perhaps from rough handling as well as from the protracted storage. The manufacturer's local agents advise that if the storage period is likely to exceed, say, 6 months, the RPA. 3 should be stored in well washed glass carboys *e.g.* used acid carboys. The carboys should be well corked and sealed and stored preferably in a cool place out of the light. Since the active ingredient of RPA.3 is susceptible to oxidation (and should not therefore be left exposed to air), it is doubtful if Estates are necessarily well advised to stock in heavily and in this connection the comments of the R.R.I.M. on the storage of Emulsion A Concentrate, section 3 above, should be noted. Recently Messrs. E. I. Du Pont de Nemours, through Messrs. Mackwoods, have advised the R.R.I.C. that during the course of a storage experiment carried out at 120°F., that is well above the normal Ceylon temperature, for a period of 16 weeks the % of xylyl mercaptan in RPA.3 fell from 36.4 to 35.5%. Although this decrease is quite small, it is not yet clear whether the storage was carried out in glass vessels or in standard RPA.3 drums.

(*e*) Latex : The possibility of a differential response to RPA.3 and its significance has already been mentioned. Stale latex, that is latex stored 2 to 3 days before coagulation, is believed (7) to be normally unsuitable for the preparation of colourless or near colourless blanket crepe in the absence of RPA.3. In the presence of RPA.3 the appearance of the finished product appears to depend upon the nature of the anticoagulant as well as upon the time of storage, quantity of RPA.3, fraction taken etc. From a limited number of experiments with Dartonfield latex; .1% formalin with .1% washing soda seems preferable as an anticoagulant to .2 to .3% ammonia, particularly if the time of storage is over 24 hours, the concentration of RPA.3 relatively large and if only a small or no fraction is taken. Neither anticoagulant is very satisfactory if the latex is 3 or more days old and ideally stale latex should only be used with great care or not at all.

The choice of field anticoagulant intended to prevent coagulation in the course of transportation to the factory on the day of collection has not been fully investigated. With the quantities of anticoagulant recommended in the R.R.I.C. Advisory Circular No. 17 2nd Supplement of 1949 *i.e.* ca .02% of ammonia, or ca .10% of sodium sulphite on the latex it has been found that sodium sulphite treated latex is never of worse and is sometimes of slightly better colour especially when the % fraction is small or zero and the proportion of RPA.3 in the region of 16 ozs. per 1,000 lbs. d.r.c. or higher. Since ammonia has been found undesirable for use with stale latex, it seems possible that the excessive use of this anticoagulant in the field by tappers on wet days or partial washouts could be a contributory cause to the discolouration sometimes seen in wet weather.

Two Estates have suggested that following wintering or with poor foliage and latex flow, possibly as a result of oidium attack, the use of RPA.3 may be unsatisfactory. Similar care may be necessary when opening new cuts or when commencing tapping after an enforced rest period as a result of rain.

(*f*) Coagulation : Storage of Coagulum before Milling : The influence of water, *e.g.* ' standardisation ' water, of bisulphite and of bulking the latex has been mentioned previously and this is, of course, largely a matter for the individual Estates to determine for themselves. As far as is known there is no evidence to suggest that under the correct conditions either acetic acid or formic

acid of good quality are unsuitable for the coagulation of bleached latex. Various Estates have emphasised the importance of proper mixing and straining (before and after taking a fraction) especially in wet weather. It is usual (2, 3, 4) to add the bisulphite before the RPA.3, but provided the time interval is not large the usual order of addition of reagents, *e.g.* 'standardisation' water, balance of the bisulphite, RPA. 3, has not invariably been found to be essential. Tests with the various types of coagulating tanks *e.g.* aluminium, porcelain, wood, glass etc. on a small scale have not so far indicated that this variable is generally of great importance, provided the necessary cleanliness is ensured. Experiments whereby coagulum from bleached latex with and without fractional coagulation is stored for various times in serum or under water have not so far given reproducible results.

(*g*) Other Experiments with latex : The addition of Laundry Blue (Reckitts Robin Ultramarine) to mask the residual yellowness of some bleached crepe has been investigated (5) and it has been found that the concentration to be employed is somewhat critical. As far as is known the use of Laundry Blue has not been adopted commercially in Ceylon. Addition of citric and tartaric acids (.01% on the dry rubber content) to repress the effects of iron and oxidation did not give any useful results in the presence of rather high concentrations of RPA.3.

(*h*) Machining and Drying : The temperature at which these processes are carried out is important (2, 3, 4) and excess machining and over-heating at drying, lamination or blanketting has to be avoided as far as practicable. It is possible that Estates short of cooling water or compelled to use the dry process may meet difficulties in the manner of discolouration. The most suitable conditions for drying bleached sole crepe laces is not yet known for all seasons and there appears to be no universal agreement in Ceylon about drying conditions even in the absence of RPA.3. Under normal Estate conditions at Dartonfield, the differences between samples of sole crepe made from Nivitigalakele Division bleached latex dried in lace form in an unassisted loft and in a warmed drying chamber were quite small. The laces dried for a longer time (8 days) at the lower temperature were very slightly less yellow, but this is almost certainly due, in part at least, to the poor temperature control in the warmed chamber where temperatures over 93—95° F. were recorded for appreciable intervals of time. When the drying time is prolonged as might occur if laces are overlooked or if the humidity rises and the temperature falls, the differences are likely to be larger and a (two and) three fold increase in drying time produced in these experiments slightly yellowish crepes from the laces dried in the warmed chamber and very slightly brown crepe from the laces dried in the unassisted loft. Bleached laces hung in direct sunlight rapidly became tacky and give discoloured brown crepes. Laces hung in a verandah out of direct sunlight, but probably subjected to reflected light were also slightly discoloured.

7. Experimental.—In this section the procedure actually used for bleaching latex is described in some detail and the results obtained on storing samples of bleached sole crepe in London are reproduced.

(*a*) Storage : The samples referred to in Section 3 above were prepared by the R.R.I.C. and shipped to the technical staff of the London Advisory Committee to investigate the softening effect of RPA. 3 as received in London and after a period of storage at low temperatures. The test procedure employed was to measure the modulus in Kg/Cm^2 corresponding to 50% elongation and the first table gives the values on the samples as received and tested at 30°C.

Samples	Test	lbs. RPA.3/1000 lbs. dry rubber 0	0.5	1.0	1.5	2	2.5
1	1	8.8	8.4	8.0	8.1	7.7	7.8
	2	9.1	8.5	8.4	8.2	8.0	7.8
2	1	9.3	8.8	8.5	7.9	7.4	7.0
	2	9.2	8.8	8.4	7.8	7.4	7.0
Means		9.1	8.6	8.3	8.0	7.6	7.4

The softening effect of RPA.3 is quite apparent but not one of the samples was considered in London to be unduly soft from a commercial viewpoint. The samples were then subjected to the storage treatment shown in the table below and tested as previously at 20° and 30°C.

Storage conditions	Tested at 20°C lb. RPA.3/1000 lb. dry rubber 0	½	1	1½	2	2½	Tested at 30°C lb. RPA.3/1000 lb. dry rubber 0	½	1	1½	2	2½
(1) In air at 3—4°C												
(*a*) 3 weeks	—	—	—	—	—	—	9.6	9.0	8.8	8.3	7.9	7.6
(*b*) Further 2 weeks	12.0	11.7	10.9	10.3	9.9	8.6	9.1	8.2	8.1	7.8	7.4	7.2
(2) In air at 5—8°C 3 weeks	12.8	12.3	11.7	11.4	10.3	10.7	9.0	8.7	8.3	8.0	7.7	7.4
(3) In air at 17 † 3°C 15 weeks	17.1	16.6	15.6	14.5	13.7	12.9	8.8	8.7	8.6	8.2	7.6	7.5
(4) In dry air at 4—5°C* 4 weeks over silicagel	36.1	35.5	31.5	32.4	30.4	26.9	10.4	9.1	9.2	8.7	7.5	7.6
(5) In dry at 13—20°C 8 weeks over silicagel	22.1	20.1	24.5	28.0	25.3	25.9	8.6	9.5	9.1	8.5	7.5	7.4
(6) In wet air at 13—20°C* 8 weeks over saturated K_2So_4 (% R.H.~97)	14.7	22.7	23.0	17.5	13.5	12.0	9.0	8.6	8.4	8.1	6.9	6.5
Total	114.8	118.9	117.2	114.1	103.1	97.0	64.5	61.8	60.5	57.6	52.5	51.2
Means	19.1	19.8	19.5	19.0	17.2	16.2	9.2	8.8	8.6	8.2	7.5	7.3

*Sample 2 only

The individual readings in the table are the mean of two test values. The hardest samples were these stored in dry air when tested at 20°C, but after a short period at 30°C none of the stored samples retained much of the hardness induced in the treatments. While no great abnormality due to the presence of RPA.3 is noted, it is apparent that there is a tendency for the softening effect of RPA.3 to be maintained at least in these tests.

The subject of the storage hardening (M50 test) of sole crepe and its importance to the consumer has already been referred to elsewhere (9) by the London Advisory Committee. Their previous tests suggested that a considerable portion of the hardness induced in crepe by cold storage might be retained at 30°C. This is not appreciably apparent in these tests, possibly due to the use of unsuitable storage conditions *e.g.* temperature and time (cf 13).

(*b*) Bleaching Procedure: The process described below is that followed at the Nivitigalakele Division of the R.R.I.C.

Emulsification of RPA.3: To every 100 parts by weight of RPA.3 required add 5 parts of Duponol OS. Stir the mixture by swirling the container or by the use of a glass rod. After mixing add the above to good quality water at the rate of 400 parts of water to every 100 parts of RPA.3 preferably in a clean glass bottle or other container. Cork the bottle and shake vigorously for about 1 minute. Reshake immediately before addition to the latex. Make fresh emulsion each day.

Bleaching with Fractional Coagulation: The latex should be delivered to the factory fresh and with sufficient anticoagulant but without a large excess *e.g.* of ammonia. A portion of the fresh bisulphite may be added in the field. Strain the latex carefully without forcing small lumps through the mesh and reduce the d.r.c. using suitable quality water to 2.5 or 2.0 lbs./gallon as convenient. Add the correct dose (or the balance thereof) of sodium bisulphite according to the total dry rubber and stir well. Add the RPA.3 emulsion at the rate of never more than, say, 16 ozs. of RPA.3 per 1,000 lbs. dry rubber. (The proportion of RPA.3 should be varied according to the conditions *e.g.* clones, tapping systems, weather etc. and may not exceed 10 ozs. in many cases with budded rubber latex and may be as low as 2 ozs. with 'normal' old seedling). Stir the latex well. Add the appropriate quantity of acid and remove a first fraction of 7—14% (or as appropriate) in the usual manner with gentle stirring with a paddle or other convenient tool. After removal of the fraction, strain the latex, add the normal dose of coagulant and stir until the latex begins to thicken. Complete the manufacture in the usual way avoiding excess machining, overheating, prolonged drying and undue delay in any stage of the process *e.g.* reworking trimmings, packing and despatch etc. Keep countersamples of the finished product.

Estates may calculate the amounts of RPA.3, Duponol OS and water required in the emulsion used to bleach the dry rubber in their latex from the table given, provided the correct proportion of RPA.3 in ounces per 1,000 lbs. dry rubber has been decided in prior trials.

Table for Calculation of Volume of RPA. 3 Required

Lbs. of Dry rubber in latex	Ounces of RPA.3 to be used per 1000 lbs. of Dry Rubber in latex									
	2 ozs.	4 ozs.	6 ozs.	8 ozs.	10 ozs.	12 ozs.	14 ozs.	16 ozs.	18 ozs.	20 ozs.
	MILLILITRES of RPA.3 to be added as Emulsion									
10	.65	1.30	1.96	2.61	3.26	3.91	4.56	5.21	5.86	6.52
20	1.30	2.61	3.91	5.21	6.52	7.82	9.13	10.4	11.7	13.0
40	2.61	5.21	7.82	10.4	13.0	15.6	18.3	20.9	23.5	26.1
50	3.26	6.52	9.78	13.0	16.3	19.6	22.8	26.1	29.3	32.6
60	3.91	7.82	11.7	15.6	19.6	23.5	27.4	31.3	35.2	39.1
80	5.21	10.4	15.6	20.9	26.1	31.3	36.5	41.7	46.9	52.1
100	6.52	13.0	19.6	26.1	32.6	39.1	45.6	52.1	58.7	65.2
200	13.0	26.1	39.1	52.1	65.2	78.2	91.3	104.3	117.3	130.4
300	19.6	39.1	58.7	78.2	97.8	117.3	136.9	156.4	176.0	195.5
400	26.1	52.1	78.2	104.3	130.4	156.4	182.5	208.6	234.7	260.7
500	32.6	65.2	97.8	130.4	163.0	195.5	228.1	260.7	293.3	325.9
600	39.1	78.2	117.3	156.4	195.5	234.7	273.8	312.9	352.0	391.1
700	45.6	91.3	136.9	182.5	228.1	273.8	319.4	365.0	410.6	456.3
800	52.1	104.3	156.4	208.6	260.7	312.9	365.0	417.2	469.3	521.4
900	58.7	117.3	176.0	234.7	293.3	352.0	410.6	469.3	528.0	586.6
1000	65.2	130.4	195.5	260.7	325.9	391.1	456.3	521.4	586.6	651.8
2000	130.4	260.7	391.1	521.4	651.8	782.2	912.5	1042.9	1173.2	1303.6

Factors used in Table.
Density = .87 gms per ml.
1 lb. = 453.6 gms.

Conversion Factors.
10 ml. RPA.3 = 0.3068 oz. Avoirdupois
= .3520 fl. oz. (British)

8. Miscellaneous

(*a*) Acknowledgement is hereby made to the Proprietors, Agents, Managers and Superintendents and other individuals, who have submitted their comments or permitted comments and views on this process to be submitted to the R.R.I.C., and to those members of the R.R.I. of Malaya who discovered and published the fact that certain organic chemicals *e.g.* xylyl mercaptan can bleach natural rubber latex.

(*b*) Estates in Ceylon which have not completed the questionnaire inviting comments on the process are hereby requested to contact their Agents for a copy or to write to the Institute under its normal terms of reference. Estates are warned that while every attempt has been made to ensure reasonable accuracy in this report, the information given refers primarily to the Dartonfield latex used in the experiments and may not be entirely suitable elsewhere without slight modification.

Estates are advised to regard the use of RPA.3 as still experimental and should ensure that their bleached product is as acceptable as their unbleached material.

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NOTES ON SULPHUR DUSTING

By

IR. J. H. VAN EMDEN

The quantities recommended below refer to a dusting sulphur containing a fine fraction (passing the B.S. 300 sieve) of 90% with a sulphur content of 85% in the fine fraction.

The rate of application for sulphur powders of different fineness and sulphur content should be calculated from the formula

$$\frac{85}{s} \times \frac{90}{f} \times \text{recommended rate of application.}$$

in which formula "s" stands for the percentage of sulphur in the fine fraction and "f" for the percentage size of the fine fraction.

It is realised that the above formula may not do justice to the fungicidal qualities of proprietary products, but failing experimental results with such products on Ceylon rubber, it is thought advisable to accept the above as a practical approximation until importers have substantiated the claims for their products by demonstrations in the field.

The sulphur powder to be used, should be in a free flowing condition ; this may be judged by shaking about ¼ lb. of the sulphur in a carefully dried 1 lb. glass jar. The sulphur should behave like fine wheat flour ; it should show no tendency to form lumps or to stick to the glass.

If the sulphur does not appear to be "free-flowing", drying in the sun should be attempted. Sulphur dusts which are not "free-flowing" will cause the output of the machines to be very irregular and will not go up well.

Machinery

As far as we are aware, there are two types of machines on the market, the "Noidium" machine of Messrs. Colombo Commercial Company and the "Whirlwind" of Messrs. Harrison Lister. Both machines are powerful enough for the purpose of Oidium control by sulphur dusting, if the fan speed is between 2,200 and 2,400 r.p.m. Both machines may be equipped with different power units and it is advisable to pay special attention to this point, as in our experience the reliability of the engine and the weight of the duster may vary with the type of power unit installed. It is beyond the scope of this leaflet to give further particulars about the various modifications.

Machines equipped with the so called "directional-duct" will be found useful if trees standing on a steep slope below a road have to be dusted. Machines with a straight duct will send the dust higher, but will require a closer spaced road system.

Road System

In order to be able to dust efficiently over the whole area and to do "spot-dusting" where required, it is necessary to have good footpaths not more than 100 ft. apart. Although the cloud may be seen to drift over great distances, the area effectively covered will rarely be more than 200 feet from the machine and 100 ft. is a safe average. If the terrain is difficult and the mere carrying of the machine is a laborious task, the efficiency of the dusting must be expected to suffer and much valuable sulphur may be wasted, at the same time leaving the trees insufficiently protected.

Number of applications and rate of application

Dusting should commence when 10% of the trees in the area show new growth, *i.e.* when green ends are appearing on last year's twigs. It is bad practice to wait till the new leaves are visible. If dusting is delayed until the new leaves are falling due to Oidium damage it will be too late to protect most of the visible leaflets and the disease will be well established in the field. Sulphur dusting is mainly preventive, not curative.

Dusting should continue until 90% of the trees have passed the sensitive stage.

For areas in which wintering is simultaneous and during fine weather the rate of application should be 12 lbs./acre/round.

If wintering is a protracted affair, it may be necessary to direct the dust to single trees or groups of trees needing treatment while other trees which are not yet in the sensitive stage or have already passed it, are left undusted. In such

cases it may be advisable to apply smaller quantities at shorter intervals, (*e.g.* 5 lbs./acre twice a week). If the weather is showery it is also advisable to use small quantities frequently.

Areas which have suffered badly from Oidium in the past and are in a bad condition may need dusting for several months in order to protect the irregularly appearing new flushes.

From the above it is clear, that no hard and fast rules can be given for dusting. The superintendent must watch the weather and the kind of wintering, and act accordingly.

Technique of dusting

The literature on the subject of application of fungicidal dusts stresses that dusting should be carried out (*a*) in still weather and (*b*) when the leaves are still wet from dew. These two points are too often neglected. Many estates have up till now followed the routine of not commencing dusting until after 10 a.m. because from that time onwards the dust rises better and is carried farther with the wind.

Objections against this practice are:

(*a*) When the Sulphur particles are deposited on a dry leaf surface, adhesion is very poor.

(*b*) Late in the morning upward convection currents are prevalent and a good deal of the dust is carried up above the tree tops and away out of the area to be treated.

(*c*) Later in the day the wind often becomes too strong to allow any dusting at all.

It has in some cases in Ceylon become a fetish to blow the sulphur dust as high as possible above the tree tops. This is defeating the whole purpose of the treatment as the dust then gets into the higher wind velocity area and convection currents and mostly drifts away without depositing on the leaves it is intended to protect.

In dusting the aim is to obtain a cloud which drifts laterally *through* the trees more or less parallel to the land surface. Not *over* the trees where it is useless.

Conditions for dusting may on some days and in some locations remain suitable for dusting until close upon midday, but this is not the rule. One should set out to complete the day's dusting between 6 and 8 a.m. If this is not possible, dusting may be continued until later *but only under the strictest supervision*. Dusting programs must not be based on late dusting. Late dusting should be seen as an emergency in order to make up for unforeseen circumstances and in any case it would be better to wait until early the next morning.

In the above, mention was made of the wind. Wind is a very important factor in dusting. *The machine should never be moved against the wind while dusting, nor should the machine be moved faster than 2 m.p.h. in still air.* If there is a light wind, the machine may be moved in the same direction as the wind or directly across it. The man in charge of the dusting must always try to keep his machine more or less under the dust cloud. because only if the power of the machine is kept under the cloud, will the dust go up high enough.

This implies, that if the machine is in a downwind position in relation to the area to be treated, the machine cannot be moved to an upwind position while dusting. If the wind is light, the machine may be carried with the feed closed for about 100 feet to be put down for about 10 seconds dusting, after that the feed should be closed again and the machine moved another 100 feet for some more dusting. If transport of the dusting machine is mechanised, it will be easier to drive to the windward side without dusting and to come down the same road with the wind, dusting and keeping the machine under the cloud.

Resting of trees during wintering

Under Ceylon conditions resting during wintering appears to be essential. If resting is omitted an increase in the number of brown bast trees must be expected and also the rate of refoliation will be much slower, thus exposing the trees for a longer period to the influence of Oidium.

In this connection it must be pointed out that the purpose of resting is to stop the drain on the tree's reserves at the time when it needs them most *i.e.* for growing new leaves and when it has no functioning leaves to provide energy.

The best thing to do would be to rest each tree for four weeks from leaf fall. As this is however impracticable it is recommended to rest each clearing as soon as budbreak has started in about 20% of the trees. To rest the whole estate as one unit is pointless. If that is done, some fields will be rested when it is too early and others when it is too late for the rest to have maximum value.

SOME FURTHER CONSIDERATIONS ON MANURING RUBBER IN CEYLON

By

D. H. CONSTABLE, *Agronomist*

The purpose of this article is to acquaint the planting community with the discoveries being made in the course of soil investigations proceeding at the R.R.I.

We are, as the result of this work, making some tentative recommendations and issuing an interim Advisory Circular as we feel that the industry is in need of immediate help particularly with so many areas suffering from poor recovery following Oidium. We would however emphasize that these recommendations are tentative and that Superintendents and V.A.'s should examine the evidence we are setting out before them and make their own decisions as to whether they will stick to the present system or accept the proposed ideas.

We consider that it is in every planter's interest to give the proposals a trial on a number of one acre areas throughout their estates. If done on young rubber, girth measurements are easily taken at the beginning and after one and two years, and comparisons with the surrounding rubber should show the value or otherwise of the treatment. It is emphasised that a large number of small areas is preferable to one or two large areas by eliminating the possibility of coincidences.

During the last few years there has been increasing interest in deficiency troubles occurring in Ceylon and a number of cases of poor yields from good clones, together with abnormal foliage and ground cover characters have been brought to our notice. In all these cases it appears that one or other of the recommended fertilizer mixtures has been applied in proper quantities regularly.

Also of course as a whole Ceylon Rubber is much less successful than Malaya or Indonesia. This is generally dismissed as a soil effect which is very probably true but the implication that nothing can be done about it therefore, is not necessarily true.

In those cases where obvious malnutrition of the rubber is occurring we have started intensive investigations.

In general at present we check the soils acidity and the quantity of lime needed to bring it back almost to neutrality, also its approximate physical composition. We take leaf samples from the rubber and the cover crops, analyse these chemically, and compare the analyses with those of similar samples taken from the best trees we can find. In the case of rubber we also make our comparison with the same clone in a healthy state.

Before outlining our results it is convenient to explain the notation for soil acidity (see Fig. 1) pH is a method of expressing effective (as distinct from total) acid or alkaline strength of any solution and uses a logarithmic scale for the purpose. The numbers, 1, 2, 3 etc. refer to 10 to the power of 1, 10 squared, 10 cubed etc. and they mean that the effective acid strength is the fraction one over ten to the power given *i.e.*

pH 1 $= \frac{1}{10^1} = \frac{1}{10}$; pH 2 $= \frac{1}{10^2} = \frac{1}{100}$; pH 3 $= \frac{1}{10^3} = \frac{1}{1000}$

that is to say that as the pH number increases the acidity gets less, and every difference of a full unit represents one tenth the previous strength. At pH 7, *i.e.* one over ten million, neutrality is reached and above pH 7 we are in the alkaline zone and getting more alkaline with increasing pH. Fig. 1 shows the pH scale and values for everyday solutions together with the range of pH's found in soil and their general effect.

With this in mind we may turn to the results obtained to date.

Firstly the soil acidity; with the exception of a few isolated patches, pH values were found to be less than 5 with a considerable number even less than 4.5.

On one estate which had been strip manured the figures on the unmanured strips were 4.5 approximately, and on the manured strip 3.9 (values in 1:1 water suspension).

The latter value is excessively acid and it was of interest to note that though the manuring was 3 months old there had been little regeneration of the Pueraria on the manured strip.

This excessive acidity is of course due to the sulphuric acid which is the residual product of sulphate of ammonia. The effect is a well known one shown in all soils not founded on calcareous parent material, which has excess lime or magnesia available to neutralise the acid. However, due to the physical properties of Ceylon soils and to the wet climate, the effect has been taken to the limit. Excess soil acidity has four bad effects on crops generally: (*a*) it indicates that the soil has no nutrient material bound (or adsorbed) to it, (*b*) it results in the presence of free aluminium, which has been proved to be a specific root poison, (*c*) it also causes excess of iron and manganese

to be present, the latter of which in excess can act as a plant poison, and (*d*) legumes cease to fix nitrogen.

Turning now to the liming requirement this is generally found to be very low in spite of the high acidity. This indicates either a very low clay content or an unreactive clay. In fact there appears to be a combination of the two factors and the soil may be summed up therefore as having a low capacity for nutrients. Typical lime requirement figures found to date vary from $\frac{1}{4}$ to 1 ton per acre which means that considerable care would have to be exercised in liming and for preference scientific assistance sought.

Most rubber soils in the low and mid country are of the "cabook" or lateritic type and are also sandy soils.

Typically they are sandy or gravelly together with "concretions" (pebbles) of iron and alumina on top with the concretions increasing in size with depth and frequently forming a solid layer. These soils are excessively well drained in general which is one of the reasons for their impoverishment and high acidity.

At the same time it makes it unlikely that soluble fertilisers will remain in situ for very long during a rainy period. Except therefore during the certain (?) dry weather months of February and August there seems very little reason to believe that sulphate of ammonia or muriate of potash will remain in or on the soil more than perhaps four weeks, after which time the crop presumably has to make do with what it can get from decaying ground cover material plus a very little from the decomposing soil, in both of which cases it has an active competitor in the ground cover.

The possible pattern may by now be clear to planters and it can be said that foliar analyses so far confirm it. The general symptoms are a yellowing of the foliage, frequently that of the previous flush when the next flush is under way.

This is also associated with estates giving only one application of their manure yearly (at full recommended quantities).

Foliar analyses have shown in five cases out of six so far, unusually low quantities of nitrogen and/or potash in the leaves both of the Hevea and the ground cover and it may be mentioned that our values for potash in "healthy" Hevea are appreciably lower than those obtained in Indonesia and Malaya.

This brings us to the question of fertilisers. It has for some time been a source of surprise to the author that, on soils as poor as Ceylon, manurial applications should be half to quarter of those given on good soils in temperate and tropical climates. His attention has recently been drawn to the fact that these mixtures represent wartime economy rations which have never been reconsidered owing to lack of data. The present mixture under test at eight points throughout the island is 20 ozs. Sulphate of Ammonia 16 ozs. Saphos and 8 ozs. Muriate of Potash per tree per year. In this connexion it may not be out of place to quote some analysis figures obtained on a rubber tree in Malaya. The tree 60 feet high and 29 inches in diameter was felled, weighed and representative analyses done on every portion of it. The conclusion was that the tree weighing 11,700 lbs. contained 35 lbs of Nitrogen, 11 lbs. of P_2O_5, 40 lbs. of K_2O and 58 lbs. of CaO as well as other minerals. If we assume this tree to be 50 years old (29 inches diameter) and a stand of 70 per acre we get a yearly requirement per acre of $35 \times \frac{70}{50} \times \frac{1}{21\%}$ Ammonium Sulphate = 245 lbs. ; 46 lbs. of Saphos ; 110 lbs. of Muriate of

Potash; and 203 lbs. of CaO assuming that all the nutrients applied to the soil enter the tree. In fact, no more than 1/3 of applied phosphate is ever utilised on the average and so the Saphos value should be increased to 138 lbs.

This then gives a total mineral requirement of 700 lbs. per acre per annum. Even at a pretty considerable discount on these figures it is obvious that we are not supplying the necessary amounts of nutrient and particularly potash to trees growing on exhausted soils or replanted soils from which the old rubber has been sold for firewood.

An estate example which may be quoted in support of these views is that of Mirishena. There the Superintendent Mr. E. C. K. Minor decided that a bad young stand was due to a potash deficiency. The area was divided into a number of blocks which were manured with R215, R215 plus 4 ozs. extra potash per tree and R215 plus 8 ozs. extra potash per tree. The result of 4 ozs. potash has been to more than double the rubber yields, with 8 ozs. giving a further non proportional increase. The generally better state of the trees is quite obvious to the most superficial survey.

Summing all this up the following points have been made :

(*a*) The acidity of the soil in some areas is such that good crop growth is doubtful. Liming is the only answer to this but must be done with discretion.

(*b*) The soil is excessively porous. It is probable that where fertiliser is applied in 1 or 2 doses per year that the majority passes into the drains. Applications as frequently as monthly for 8—9 months in the year might well be considered.

(*c*) The present applications (yearly total) of fertiliser may be too small and the proportion of potash too low. A 100:100:80 mixture would be better at rates of up to 500 lbs. per acre possibly. The high rate would however be wasted unless applied in the frequent small doses.

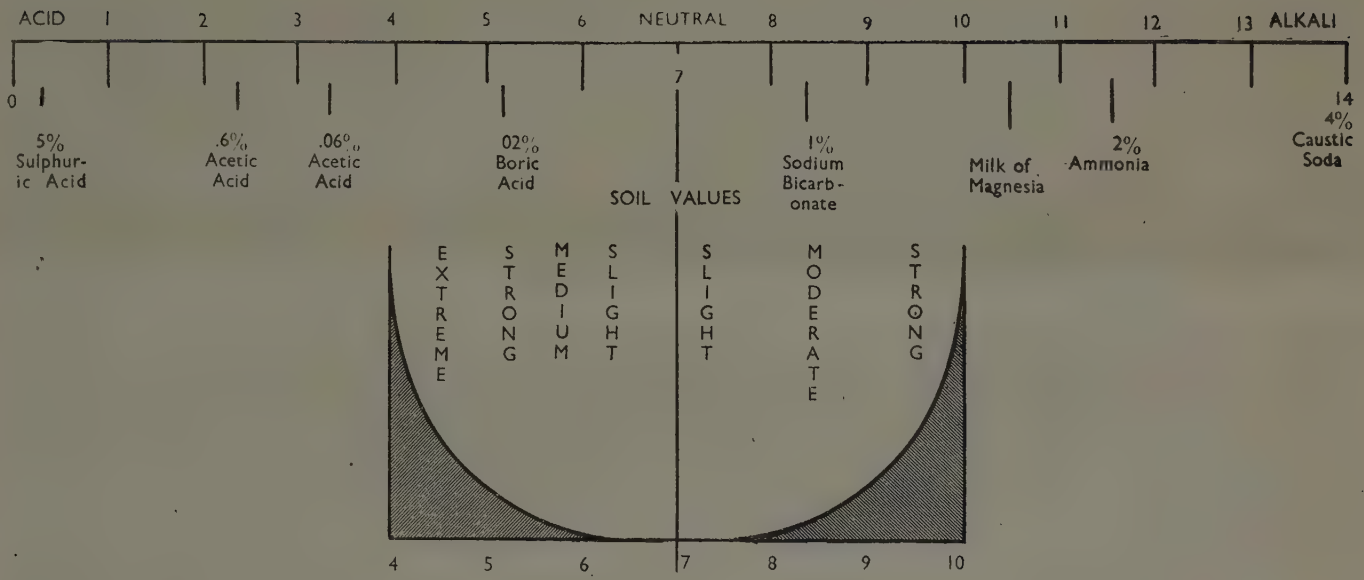
Superintendents may ask how the continued use of sulphate of ammonia fits in with the earlier remarks about its acid effects. The answer here is that it is the cheapest source of nitrogen and it is generally more economic to offset the acid effect with lime which is very cheap. Alternative non acidifying fertilisers are Sodium Nitrate or Ammonium Phosphate (largely used in Indonesia.)

Finally the speculative nature of the conclusions drawn from the facts must be emphasised. If planters desire to test the truth of any of these conclusions we shall be pleased to assist. In the meanwhile experiments for the exact testing of these ideas are now under way but it will be a considerable time before any general conclusions can be drawn.

However we feel that the combination of factors mentioned in this lecture do justify some revision of our manuring recommendations. In particular we consider that the potash content should be appreciably higher, and further that frequent applications are to be recommended. We are intending to issue a new Advisory Circular covering these points. The mixture proposed is 4:6:5: $N:P_2O_5:K_2O$, or 100 lbs. Sulphate of Ammonia, 100 lbs. Saphos, and 50 lbs. Muriate of Potash applied at the rate 1 lb. per tree first year 2-3 lbs. per tree 2-6 years, 4 lbs. per tree thereafter.

(*Lecture delivered to the Kalutara District P. A. on Tuesday 24th February 1953*).

THE pH SCALE OF ACIDITY



HIGH RUBBER YIELDS ON THE HILLS SUCCESSFUL EXPERIMENT BY R.R.I.

By

H. E. YOUNG, *Director*

Rubber yields on lands at 1000 feet or more elevation have seriously fallen for a number of years and most of the high grown areas are either untapped or of extremely low yield due to the ravages of Oidium leaf disease.

In 1941—42 the Rubber Research Institute set out a trial consisting of 59 different clones at Kepitigalla estate in the Matale District at an elevation of 1600 feet in order to see if any were resistant to Oidium leaf disease. The area was one of the worst affected with the disease which is the main cause of the collapse of high grown rubber.

Of the 59 clones used one has shown itself to be resistant to the disease. This clone LCB. 870 was imported by the Research Institute from Indonesia in 1940 and has grown with great vigour and without loss of leaf. Its growth compares very favourably with the most vigorously growing low country rubber.

Now twelve years of age, the trees stand out as an oasis of green lush growth amongst the almost leafless ghosts of other trees, seedling and otherwise, in the neighbourhood.

The most recent results of tapping this resistant clone at this experiment has given a yield of approximately 5 lbs per tree per year from the 24 trees present. Yield results from such a small area are of course necessarily suspect and can only be taken as a rough guide.

The introduction and very successful proof of this clone by the R.R.I. has made it possible to reclaim the degraded and now largely waste rubber lands of the hill country.

The yield of this clone at this stage at Kepitigalla is approximately double that of the overall Ceylon average per acre and while its yield is lower than some of the newer clones now being grown but which will not grow at high altitudes because of disease it certainly promises to give profitable and useful yields where others cannot survive.

Other experiments involving budding this clone on the tops of higher yielding trees and thus producing leaves resistant to disease but with a high yielding trunk have been under way for some years at the R.R.I. and so far with successful results. There has been no abnormal wind damage of the budded shoots when established and indications from Indonesia suggest that when budded at the required height the yield of the tapping panel is not reduced.

LCB. 870 has a desirable white latex and is a vigorous grower putting on an average girth of 3 inches even when in tapping.

It will be recalled that this method of top budding trees to provide resistance to disease, which was developed in Java, has been used successfully in South America in order to establish plantations of rubber in that area where until recently plantation rubber could not be grown beause of another and more dreaded disease South American Leaf Blight.

The R.R.I. has sent material of LCB. 870 to the Americas for testing against South American Leaf Blight as part of its programme to be ready for this other and more devastating disease should it ever appear in Ceylon.

Budwood of the resistant clone LCB. 870 has been produced and is now available to the industry from the Rubber Research Institute.

The dark green lush growth of the Oidium resistant clone LCB. 870 is seen against the background of the disease devastated normal trees. LCB. 870 has also given a very satisfactory yield of white latex

REPORT ON THE CONFERENCE OF THE RUBBER RESEARCH INSTITUTES AT BOGOR, REPUBLIC OF INDONESIA—JULY 1952

By

E. J. RISDON, *Chemist*

1. Introduction.—The papers read and discussed at the Conference were divided into the distinct Sections, Agricultural and Chemical–Technological, and the Sections held their meetings concurrently at the Centrale Proefstations Vereniging (C.P.V.) and at the Indonesian Rubber Research Institute (I.N.I.R.O.) respectively. The Chemist of the R.R.I.C. was therefore directed to attend the Chemical-Technological Section of the conference. In the subsequent visit to the Deli district of Sumatra, arranged through the kind offices of the Experiment Station of the A.V.R.O.S., the Chemist was taken round the factories of the Estates visited by the factory technologist, while the Director was escorted by the field staff.

2. Visits at Singapore.—During the course of a prolonged in-transit stop at Singapore, the Director and Chemist were allowed to inspect one large and one medium sized Singapore packing house and the Firestone remilling factory. It is of interest to record that one Packer claimed to have overcome bale distortion problems through the use of small size bales (made in baling boxes) and through proper arrangement of the bales in his storage areas. This Packer also organised his packing to give some measure of blending as a routine procedure.

The technical personnel of the Firestone remilling factory explained their own system of product classification on the basis of technical properties, emphasising *inter alia* the importance attached by their buyers to the copper and manganese content of their product. In the latter connexion the company offered to the R.R.I.C. at cost a replica of the instrument used as a rough guide to the copper and manganese contents of rubber. Neither of the Packing Houses undertook routine technological classification tests on their product, although one was in the process of carrying out technical classification experiments with the R.R.I.M.

Due to the shortage of time it was not possible to accept any invitation to visit the R.R.I.M. at Kuala Lumpur on the return journey from Sumatra.

3. The Conference, Chemical-Technological Section.—For the purpose of this report the commercial implications as well as the scientific aspects of the conference are considered briefly. The Conference was officially opened at a joint session of both Sections and commenced at the joint session with a series of papers classified as 'Physiology'. The most interesting from the Planters' viewpoint may be those on the artificial stimulation of yield *e.g.* by injection of copper etc., and an extra profit of about 22% (for the year) of injected over control trees is claimed in one experiment in Indo-china. The response to one injection is not permanent and not all trees respond to the treatment. The criterion of response may be the d.r.c. of the untreated latex (Compagnon I.R.C.I.) What still remains a little uncertain is the explanation of the response and the numerical value of the copper content of the finished products *i.e.* sheet, crepe or concentrate made from the latex of injected trees. While it appears that much of any extra copper may perhaps be removed in

process under certain conditions (G.J. van der Bie, I.N.I.R.O.), it is possibly desirable at present to conduct periodic routine tests of copper contents of the products.

F. J. Paton (Dunlop Malayan Estates) described the characteristics of the heavier yellow fraction of latex which is separated on centrifuging fresh latex and tentatively concluded that the significant part of the yellow fraction complex is a lipo-protein, possibly a tricomplex involving protein, lipid and ions, made up of proteins and lipids bound together by electrostatic forces. The inter-relationship between these substances (protein and lipid) is determined by the pH. At a pH greater than 8.5 no yellow fraction can be separated but as the pH falls it is progressively easier to separate. Since latex is usually standardised before fractionation, it is interesting to note that dilution of the yellow fraction, hence of the latex itself, produces an immediate drop in pH. Latex concentration which is carried out at higher pH is not greatly affected by these phenomena, although F. J. Paton noted a tendency for the white fraction to have a lower mechanical stability and possibly a higher chemical stability than whole latex. A paper by W. L. Resing (I.N.I.R.O.) on the colouring substance of latex pointed out that the colour is concentrated in the so-called Frey-Wyssling particles which separate on centrifuging, largely in the upper part of the yellow fraction. Extraction and chromatographic examination of the pigment of crepe of yellow fraction latex showed the main component to be B carotene. W. L. Resing reported little evidence of clonal differences in respect of colouring matter except in the case of P.B. 186. Presumably, therefore, a chemical effective as a bleaching agent for one clone would be expected to be effective on many others, although the concentration necessary might vary from clone to clone.

The papers on the significance of the yellow fraction and of other factors on spontaneous coagulation do not appear to the writer to have greatly clarified the situation at least with respect to the prevention of coagulation. Thus G.E. van Gils (1947) postulated the presence of fatty acids in latex after it is tapped by the breakdown of fatty materials including phospholipin, leading to the formation of destabilising calcium and magnesium soaps. R.H. Smith (R.R. I.M.) pointed out that if latex phospholipin undergoes enzymatic or bacterial hydrolysis after tapping then it would be expected that the acid-soluble phosphorus content of the latex would increase on storage and he detected no such increase. Further the phospholipin, extracted from latex in a state as near as possible to that obtaining in the tree, differed according to R. H. Smith from that present a few hours after tapping and hydrolytic breakdown will not explain the differences. F. J. Paton considered that the suggestion that coagulation is initiated by the interaction of magnesium and fatty acids is an oversimplification and commented *inter alia* that formaldehyde and other substances affecting the properties of proteins prevent precoagulation whereas ordinary antiseptics do not. F. J. Paton noted that it is possible to formulate a theory that spontaneous coagulation is initiated in the lipo-protein micelles where there are active enzymes which affect the physical properties of the protective proteins, possibly by a process of denaturation whereby the rubber particles are then caused to aggregate. In instances where spontaneous coagulation takes place early and at high pH, the physical condition of the lipo-protein may be the determining factor. In stable latices which persist for a long time (until the pH approaches about 5) it is assumed that the lipo-proteins exist largely as small particles as in the (more stable) white fraction latex. F. J. Paton also pointed out that since the lipo-protein complex is much influenced by salts in the serum the mineral content of latex may be important in determining the initial

stability of latex. This, of course, implies that certain areas can expect more trouble from coagulation than others and from the evidence available for Ceylon this has been known for some time.

Considering certain of the practical aspects of the importance of the yellow fraction, Th. Schoon (I.N.I.R.O.) and J. J. Zeehuisen (C.P.V.) suggested the use of the alkaline salts of weak acids with preservative properties *e.g.* sodium, potasium or ammonium benzoate, for the coagulation of the yellow fraction (*i.e.* fractional coagulation) with a view to colour improvement. Although the added sodium benzoate should be washed out in process, an improved resistance to mould is claimed by virtue of a decreased protein content and water absorption. The importance of short term preservations of latex is well known to Planters and W. L. Resing *et al* (I.N.I.R.O.) described experiments designed to avoid the drawbacks (primarily in RSS manufacture) associated with the conventional ammonia treatment. Various suggestions concerning *inter alia* the use of formaldehyde with and without other chemicals were made during the discussion by G. J. van der Bie, W. G. Wren (R.R.I.M.) and by D. B. Schrieke (R.C.M.A.), but there does not yet appear to be general agreement on near ideal alternatives to the conventional treatments and from the comments given in the previous paragraph general agreement may be unattainable.

The general subject of coagulation was further considered from the viewpoint of new or revived coagulants and of accelerated coagulation. Th. Schoon and J. J. Zeehuisen pointed out that O. de Vries suggested oxalic acid as a coagulant in 1920 and that the relative U.S. prices of oxalic and formic acids in early 1952 appeared in favour of oxalic acid. It is claimed that oxalic acid will produce a lighter crepe which keeps its colour longer and that the application of bisulphite may not be necessary. G. E. van Gils (I.N.I.R.O.) and W. L. Resing considered means of economising in acid and of permitting the repeated use of the same coagulant solution. For this purpose they listed coagulation accelerators (C.A.) into the following classes. 1. Those affecting the electric charge of the colloid particle such as C.A. containing polyvalent cations *e.g.* calcium salts and those containing a surface active kation *e.g.* amines, quinine sulphate, kationic soaps, 2. Anionic soaps with insoluble calcium and magnesium salts *e.g.* sodium laurate and 3. Anionic soaps with soluble calcium and magnesium salts *e.g.* Teepol. However no specific recommendation appeared to have been offered. W. J. van Essen (I.N.I.R.O.) and G. E. van Gils described preliminary experiments on the continuous preparation of rubber by flocculation. No samples of the product were seen.

Under the general subject of special types of rubber or special process it is proposed to consider the papers on dialysis, purified rubber, preserved sheet and Mealorub. Th. Schoon in a paper entitled 'Hydrogels of Rubber' investigated the rate of dehydration of coagulum and the water absorption of raw rubber. Neither process appeared to take place smoothly with respect to time. The explanation of pseudo-equilibrium is discarded in favour of one based on the different degrees of packing of globules of latex particles. On this basis loose packings are stabilised by the presence of non-rubber components and the poor drying characteristics of purified rubber would be due to compact packing. (It is worth recording here that discontinuties have been observed in our own 'drying' experiments). Th.Schoon and P. J. van der Linden (I.N.I.R.O.) suggested that dialysing coagulum can reduce the drying time of the resultant crepe with no adverse effect on the colour. Th. Schoon also pointed out that a purified rubber may be made by dialysing coagulum ; further,

the product (called C. D. rubber) could, if required, be prepared by smallholders for sale to remillers. W. L. Resing described a method for the preparation of purified rubber by enzymatic treatment using the juice of the tree Ficus Callosa.

Th. Schoon and J. J. Zeehuisen pointed out that the construction and operation of a smoke house requires some technical knowledge and that it would be desirable to replace it in some cases by air drying. For this purpose the addition of 3 to 4 grammes of sodium benzoate per kilo d.r.c. of the latex followed by coagulation with formic or oxalic acid was suggested. Sheets containing sodium benzoate should have improved mould resistance compared to RSS and if benzoic acid is used as a coagulant a decreased scorching tendency should be found. The cost of the sodium benzoate is claimed to be roughly equal to the cost of smoking. J. C. de Neef (I.N.I.R.O.) presented a paper giving detailed particulars on the preparation of 'Mealorub'. The commercial future of the product in competition with other materials is, in the opinion of the writer, still uncertain.

The remaining papers are regarded as concerned with improvements in the Estate's finished products (*e.g.* concentrate, RSS, Crepe) and included papers on technical classification and related subjects, bale deformation, dirt contents and ageing etc. Thus F. J. Paton mentioned one of the properties of concentrate required for the production of foam rubber when he described the effect of magnesium on the gelling of latex with silicofluoride. The production of foam rubber requires a delayed action gelling agent, which must however be sufficiently rapid to permit gelling before the structure of the foam has broken down. Sodium silicofluoride is the preferred gelling agent and its gelling action is attributed to a fall in pH with the simultaneous production of silicic acid which probably assists coagulation. Previous workers have suggested that under the influence of sodium silicofluoride, the gelling pH of ammoniated latex is a characteristic of the latex. With most ammonia preserved concentrates gelling takes place at a pH of about 8 and when the gelling takes place at a higher pH, as is found with concentrated latex from Glenshiel 1, the properties of the gels are not normally considered suitable for the usual foam process. It is known that Glenshiel 1 latex has a high magnesium to phosphate ratio and F. J. Paton's paper also described experiments relating to this subject. During the course of discussion F. J. Paton indicated that the maximum permissible concentration of magnesium in latex is of the order of .009 to .01%. (It is believed that this figure is the % expressed on the d.r.c. of the concentrate). The addition of ammonium phosphate to magnesium containing latex was not considered entirely satisfactory as it interferes with the action of the zinc compounds.

K. F. Heinisch (I.N.I.R.O.) gave a short review of an investigation on the dirt content of crude rubber. The paper dealt with removal of dirt as a result of soaking the rubber in various chemicals. The utility of the chemicals is based on their washing effect defined as:

$$\frac{\text{Original Dirt} - \text{Dirt after Treatment and Remilling} \times 100}{\text{Original Dirt.}}$$

The chemicals recommended included Acto 600, Teepol, Detergent E.40, Darvan 1, Igepan 1, Resolin C and Sodium oleate. The effect of these chemicals may be improved by the addition of trisodium phosphate or sodium sulphate or both. Wetting agents, such as Vulcastab L W, Acto 600, Darvan 1 and

Teepol were stated to be able to brighten the product depending upon the type of contamination and a brightening effect due to 0.3% $H_2 SO_3$ solution was also claimed.

K. F. Heinisch described the use of a home-made 'Rubberscope' type of apparatus for the determination of the ageing behaviour of crude rubber during storage. The apparatus is used with plasticity measurements to detect the use of excess sulphuric acid coagulant, or the presence of copper or manganese. Considering the subject of bale deformation, K. F. Heinisch produced theoretical evidence for the use of small bales to prevent deformation and suggested sizes of $19 \times 47 \times 60$ cms instead of $47 \times 47 \times 69$ cms. This suggestion was criticised by M. Bocquet (I.R.C.I.) on the grounds of possible consumer objection and F. J. Paton indicated that the Dunlop small bales are rather expensive to handle. G. J. van der Bie considered that the R.M.A. would handle smaller bales provided that the bales could conform to the present processes, and that with a large volume of smaller bales the handling charges should not be increased. For proper pressing K. F. Heinisch advised a force of at least 5 Kg. cm^2 (approx. 71 lbs./$inch^2$) over a minimum of 24 hours.

The papers on technical classification and allied matters clearly demonstrated the interest shown in this subject in the producing territories. Unfortunately no useful suggestion was offered on the subject of the classification of border line rubber, but a memorandum condemning the Mooney Viscosity test was prepared outside the conference. M. Liponski (I.R.C.I.), A. G. J. Arentzen (I.N.I.R.O.) and J. J. Zeehuisen described *inter alia* detailed classification surveys in their own territories. C. Vervloet (A.V.R.O.S) summarised data on the effect of conditioning and testing under different climatic conditions for M. 600 values. J. C. de Neef (I.N.I.R.O.) considered the influence of the method of preparation of the crude rubber on its technical classification. This paper is of interest, because, in general, the differences observed by O. de Vries in his manual 'Estate Rubber' are similar to those obtained in the paper. O. de Vries' manual was published some years ago, but copies are not readily obtained at present. J. C. de Neef drew attention to the significance of maturation on the level of the modulus. The importance of this type of work (which has been or is being carried out in Malaya and Indo-China also) to the Planter is that is assists him to ascertain the cause of the technological variability encountered at his unit. C. Cretin (I.R.C.I), continuing the work of P. Compagnon and C. Cretin, who previously investigated the correlations between nitrogen in latex (as a % of dry matter) and modulus, between nitrogen in latex and d.r.c. and between d.r.c. and modulus, described work done on the relationship between the modulus and the NH_2 index. The latter is obtained by titration with alcoholic perchloric acid to pH 4.0. A correlation coefficient of the order of 0.96 is claimed and the method may be suitable for predicting the value of the modulus. The alternative method based on the relationship between the nitrogen content as a % of dry matter and the modulus (the correlation coefficient is positive) is not entirely suitable as the determination is time-consuming and the value of the appropriate 'factor' appears to vary from time to time. The use of the relation between the d.r.c. and the modulus (for which the correlation coefficient is negative—the higher the d.r.c., the lower the modulus) to predict the value of the modulus is not recommended for cases where the latex is diluted by rain. Figures given by W. G. Wren (R.R.I.M.) did not suggest that base content changes would account for all the variability encountered in technical classification surveys.

W. G. Wren presented a paper by R. I. Wood (R.R.I.M.) on the Mooney viscosity changes in freshly prepared raw rubber. In general the Mooney

viscosity of raw rubber, except perhaps 'F' (or formaldehyde treated) rubber, cannot be expected to remain constant on storage or shipment. R. I. Wood and others found that the rate of change and the extent of the increase in Mooney viscosity are both affected by the relative humidity, both being most markedly influenced at values below about 30% R.H. The rate of change in dry air increased with decreasing thickness and increasing temperature (in the range examined), although the significance of the latter is masked by oxidation changes above about 30°C and on prolonged storage. The Mooney values continued to increase long after the rubber had reached constant weight on drying. R.I. Wood considered that the overall effects are the result of two opposing processes, one the normal oxidative breakdown and the other a molecular build-up which may be initiated and maintained by the presence in the rubber of peroxide or other free radical forming groups. Under conditions of tropical storage at high relative humidities the balance for a freshly prepared rubber is in favour of a slight hardening to equilibrium. Removal of water during storage at lower humidities upsets the balance in favour of hardening. The molecular build-up mentioned above is believed to correspond to the formation of the well known benzene insoluble gel suggesting a crosslinked structure, and in this connexion reference may be made to the abstract of G. W. Drake's paper below. The practical significance of R. I. Wood's paper, which has now appeared in the Journal of the R.R.I.M. (1952 **14** 20—39), is that it throws much light on the reasons underlying why the Mooney classification has not been found of great value to natural rubber consumers and why this test may well be replaced or dropped. At the same time the paper makes it clear that part of the variability in hardness observed in raw natural rubber could be due to daily hygrometric differences between and within individual drying and smoking sheds. There is also some evidence that xylyl mercaptan (the active ingredient of RPA. 3) which is believed to increase oxidative breakdown during mastication may reduce hardening during storage by a similar process. This may be of great significance, as R. I. Wood's figures appear to suggest that air dried sheet may not have reached 'Mooney equilibrium' by the time it is dry and is removed from the warm air drying chamber.

G. W. Drake (R.R.I.M.) in a paper on osmotic measurements of the molecular weight of rubber hydrocarbon pointed out that whereas the average molecular weight of natural rubber when freshly prepared is probably well over a million and includes a substantial portion with a molecular weight of several millions, by the time the smoked sheet has reached temperate climates the high molecular weight portion has probably been converted to gel (*i.e.* becomes substantially insoluble in the solvent selected for the test). 'F' (formaldehyde treated) rubber appeared to retain the major part of its high molecular weight material. W. J. van Essen (I.N.I.R.O.) considered that the change taking place in the rubber molecule during storage of latex is principally crosslinking by means of oxygen—oxygen vulcanisation—whilst at the same time an oxidation takes places and the molecule is broken down. G.E. van Gils, who presented W. J. van Essen's paper, gave figures showing that the Mooney viscosity of rubber from ammonia preserved latex decreased and that from formaldehyde preserved latex remained substantially constant in tests involving limited storage.

The full conference papers will be published in Indonesia in due course and only summaries or abstracts were usually available for discussion at the conference. No official reports or abstracts of the discussion have been received and the writer would therefore like to apologise to those concerned for any errors or omissions in this report.

4. **Visit to Deli District of Sumatra**: The officers of the Experiment Station of the A.V.R.O.S. at Medan, Sumatra, very kindly arranged an itinerary for the Director and Chemist of the R.R.I.C. At the same time the Director of the A.V.R.O.S., Ir. C. Schmidt, permitted his technologist, Ir. C. Vervloet, to act as guide. Visits were paid to the A.V.R.O.S.' own experiment station, to the Hollands-Amerikaanse Plantage Maatschappy (H.A.P.M.) plantation at Kisaran, to the Deli Batavia Rubber Maatschappy. (D.B.R.M.) plantation Dulok Ula and to a Rubber Cultuur Maatschappy 'Amsterdam' (R.C.M.A.) unit.

While the problems facing the Sumatra industry are presumably substantially those meeting Planters in Ceylon, it is worth pointing out that, to the writer at least, there appeared a number of important differences arising from a variety of causes.

1. *Yields*: The yields of dry rubber per acre are much higher in many cases in Sumatra. Thus a figure of over 1700 lbs./acre for an area probably in excess of 10,000 acres was quoted with experimental areas, possibly 500 acres or more in one unit, whose yields were stated to be well above the previous figure. Yields of this order compared to values of say, 1000 lbs./acre require either more efficient and economic use of the factory equipment or a relatively larger factory capital outlay on a per acre basis.

2. *Size*: Many of the individual units are much larger and one of them was reported to be of the order of 60,000 acres. Units as large as this find it economical to employ their own specialist (field and technological) personnel or advisers. This has led to the development of large centralised factories with qualified personnel supervising or capable of supervising the production of what are to Ceylon Estates special products *e.g.* creamed latex, centrifuged latex, 'F' rubber and spray dried rubber. This policy naturally permits the companies concerned (*a*) to develop their own proprietary clones using as starting material the best clones available from the Experiment Stations to which they contribute or with which they directly or indirectly exchange material and (*b*) to carry out under proper supervision their own selection trials and to do their own multiplication.

3. *Rehabilitation*: While it was understood that bandit troubles are practically if not entirely unknown to this area, it is apparent that the Companies do not all claim to be fully rehabilitated as considerable areas of rubber, frequently the young budded rubber, were uprooted for the purpose of growing food crops under the Japanese occupation. It is understood that in certain areas difficulty may perhaps, be occasionally encountered with villagers settling on lands just cleared for the purpose of replanting.. Certain of the plantations appeared to have elaborate drainage systems and the successful operation of these must presumably depend upon the state of the appropriate rivers into which they drain.

4. *Labour Conditions*: Some of the Plantations informed the visiting members of the R.R.I.C. that there was an acute shortage of labour in their district. To alleviate this condition their tapping procedures had been entirely revised so that, for example, a tapper did nothing but tap trees and his daily task might be upto 900 trees. In the factories the installation of latex concentration plant is favoured, as its labour requirement compared to Crepe production was shown to be far less per pound of rubber shipped. Apparently

one factory did not at the time of the visit consider it worthwhile allocating labour for the purpose of recovering and processing the rubber from its skim. The exact cost of production or labour costs were not released but a figure of about Rupiahs 10/--per day was said to be an estimate of wages and all free or subsidised services rendered by Plantations. (At that time the official exchange rate was approximately £1 sterling equal to Rupiahs 31.30).

5. *Form of Shipment etc.*: While some of the products of the larger Sumatra factories may be resorted in the East before final shipment to the consumer countries, the RSS observed was properly baled at the factory before shipment. (Consideration of soil types, intensity, and quality of tapping, state of the covers and similar field matters are outside the scope of this report).

None of the Plantations visited seemed to be actively engaged or greatly interested (at present) in technical classification but this may be due to the fact that much experimental work is to be done at the A.V.R.O.S. Experiment Station in Medan, where a testing laboratory is already in operation.

Typical smoked sheets and lace crepe processes and latex concentration by creaming and centrifuging processes were shown to the Director and Chemist, but it is not necessary to describe these in any great detail. The smoked sheet process appeared more labour saving than is usual in Ceylon, the latex being transferred in overhead or raised pipes or troughs, and the coagulum floated out in water. Strip coagulation is not universally popular due to the thick portions usually encountered at the 'bends' of the strip. Lacquer coated ebonite seemed to be one of the favoured materials for coagulating equipment. The smoke house used is reported to be of the standard tunnel type with provision for the initial period of at a temperature of about 100—110°F followed by a period at upto about 130°F. One of the factories used unassisted air drying for its laces, but the second had divided its drying house into compartments or funnels, holding a half to one days crop. The whole drying system at the latter factory was ingeniously laid out to allow application of the whole warm air draught (by suction fans at the top) to whichever funnel required it. The distance between mats was understood to be only about 4 cms and even this may be decreased later. (4 centimeters is approximately one and a half inches).

One factory had experienced difficulties due to the high humus content of the factory water and overcome it by controlled flocculation with aluminium sulphate. In another factory parts of the spray dried and U.S. 'F' rubber process were examined.

5. **Miscellaneous**: There were a number of miscellaneous visits and informal discussions at the conference. The Director of I.N.I.R.O., Dr. Ir. G. J. van der Bie, permitted some of the delegates to visit the laboratories of I.N.I.R.O. where *inter alia* they were shown the equipment used for Mealorub production and samples of coloured crepes.

The writer would like to place on record his appreciation to all those who contributed directly and indirectly to the conference and to the visits mentioned in this report.

Submitted to the Rubber Research Board,
September 1952.

RUBBER RESEARCH INSTITUTE OF CEYLON

MINUTES of the 114th meeting of the Rubber Research Board held at the Planters' Association Head Quarters, Colombo, at 2.30 p.m. on Thursday 31st July 1952.

Present: Mr. W. A. Paterson, J.P. (in the Chair), Dr. H. E. Young (Director), Mr. W. P. H. Dias, J.P., Mr. W. Herbert de Silva, Major Montague Jayewickrema M.P., Gate Muhandiram Arthur D. S. Jayasinghe, Dr. A. W. R. Joachim (Director of Agriculture), and Mr. F. A. Ruck.

Senator C. F. W. Wickremasinghe had expressed his inability to attend.

1. **BOARD** — The Chairman welcomed to the Board:

(*a*) Major Montague Jayawickrema M.P. who had been renominated by the Hon'ble Minister of Agriculture & Food to represent the House of Representatives for a period of three years with effect from 21st July 1952.

(*b*) Senator C. F. W. Wickremasinghe who had been nominated by the Hon'ble Minister of Agriculture & Food to represent the Senate for a period of three years with effect from 21st July 1952.

2. **MINUTES—**

(*a*) *Confirmation* — Draft Minutes of the meeting held on 19th May 1952, which had been circulated to members, were approved and signed by the Chairman as correct.

(*b*) *Matters arising from the minutes.*

Visiting Engineer's report — Extra 25KW. Generator — Quotations for the supply of a 25KW. Generator set were considered and purchase approved.

3. **REPORTS AND ACCOUNTS—**

(*a*) *Director's and Technical Officers' Reports for the 1st half year* 1952 — These were approved and it was agreed that future reports should be for half-yearly rather than quarterly periods.

(*b*) *Estate Accounts from January to March* 1952 — were tabled.

(*c*) *Investments* — Withdrawal of a fixed deposit and investment of the amount in Ceylon Govt. 3% Loan 1973/78 was reported and approved.

(*d*) *Supplementary votes* — Supplementary Votes amounting to Rs. 30,530/- were passed to cover the cost of the following items:

1. Two portable Aerogen gas machines.
2. Store for sulphur & dusting machines.
3. Portable gantry for factory.
4. Extension to Estate Supdt's bungalow.
5. Sulphur dusting equipment.

4. STAFF—

(*a*) *Director* — It was reported that Dr. H. E. Young, Director, had returned from leave and resumed duties on 26th June 1952. He had gone with Dr. Risdon, Chemist, to attend the Conference of Scientific Officers of Rubber Research Institutes at Bogor, Indonesia, on 10th July and returned on 29th July.

It was noted that a report on the visit would be issued to members shortly.

(*b*) *Re-engagement of* 3 *Assistant Propaganda Officers* — Agreed that Messrs. N. W. Palihawadana, H. H. Peiris and K. Wilson de Silva, Assistant Propaganda Officers of the Smallholdings Dept. be re-engaged for further periods of four years each on termination of their contracts in September and October 1952.

5. *Inspection of rubber lands by Rubber Instructors* — Approval was given for the inspection of rubber lands by Rubber Instructors of the Smallholdings Dept. in connection with applications to the Rubber Controller for replanting under the Rubber Rehabilitation Loan Scheme.

6. TECHNICAL MATTERS—

(*a*) *Export of rubber seeds and plants to Pakistan* —In response to a request from the Trade Commissioner for Pakistan in Ceylon it was agreed that a small quantity of rubber seed and budded plants be supplied for export to Pakistan for experimental purposes.

(*b*) *Analysis of Sulphur Samples* — Agreed that the analysis of sulphur samples, which at present takes up such a large portion of the Mycologist's time, need not be undertaken by him in future as it can be done by a commercial firm of analysts when the required specification is make known.

7. LONDON ADVISORY COMMITTEE—

(*a*) *Annual Report for* 1951 — was tabled.

(*b*) Minutes of the 3rd meeting of the Executive Committee, 2nd meeting of the Latex Sub-Committee, and 1st meeting of the Agricultural Sub-Committee were tabled.

The meeting then terminated.

C. D. de FONSEKA,
Secretary-Accountant.

Dartonfield,
Agalawatta.
15-8-1952.

RUBBER RESEARCH INSTITUTE OF CEYLON

MINUTES of the 115th meeting of the Rubber Research Board held at Dartonfield at 2.30 p.m. on Monday 27th October 1952.

Present: Mr. W. A. Paterson, J.P. (in the Chair), Mr. W. P. H. Dias, J.P., Mr. W. Herbert de Silva, Mr. R. J. Hartley, Dr. A. W. R. Joachim, M.B.E. (Director of Agriculture), Major Montague Jayawickrema M.P., Gate Muhandiram Arthur D. S. Jayasinghe, Senator C. F. W. Wickremasinghe and Dr. H. E. Young (Director R.R.I.).

Mr. R. H. Wickremesinghe C.C.S. (Controller of Supply & Cadre) had intimated his inability to attend.

Mr. W. Herbert de Silva and Gate Muhandiram Jayasinghe inspected the clearings at Hedigalla and some of the buildings at Dartonfield in the morning in the company of the Director and the Estate Superintendent.

1. BOARD—

The Chairman reported that Mr. R. J. Hartley had returned from leave and resumed membership with effect from 8th October 1952, relieving Mr. F. A. Ruck who had been acting for him. A vote of thanks was passed for Mr. Ruck's services.

2. MINUTES—

(*a*) *Confirmation* — Draft minutes of the meeting held on 31st July 1952, which had been circulated to members, were confirmed and signed by the Chairman.

(*b*) *Matters arising from the minutes—*

1. *Research Assistants* — Agreed that Mr. M. Nadarajah B.Sc. (Ceylon) be appointed Research Assistant, (Chemical Department) on probation.

2. *Planting material for Smallholders* — The minutes of the Conference with the Dept. of Agriculture were considered and the arrangement that clonal seedlings should be supplied by the Dept. of Agriculture and budded stumps by the Institute was approved.

3. *Decision by Circulation of papers — Exchange of budwood between various Institutions in South East Asia*—It was reported that members had agreed to the proposal made in C.PP 1690 & 1690A and that the necessary action had been taken.

4. REPORTS AND ACCOUNTS—

(*a*) *Research Programme for 1953* — was considered. The initiation of a breeding programme as suggested by the Director was considered to be most important and it was agreed that a local officer with experience of this type of work be appointed to the Botany Dept.

(*b*) *Auditor General's Report and Balance Sheet for 1951* — were approved. Overexpenditure on revenue and capital votes amounting to Rs. 22,132/- and Rs. 11,594/- respectively were approved and unspent balances of 1951 capital votes amounting to Rs. 259,197/- were revoted for 1952.

(*c*) *Statements of Receipts and Payments for the Quarters ended 31st March and 30th June 1952* — were approved.

(*d*) *Estate Accounts April to June 1952* — were tabled.

(*e*) *Draft Estimates for 1953* — Draft estimates providing for income and expenditure as follows were approved.

Income			Rs.	1312950
Expenditure :				
Revenue	Rs.	1132372		
Capital	„	538950	„	1671322
Excess of Expenditure over Income			Rs.	358372

(*f*) *Inventory Report for 1951* — was adopted.

(*g*) *Audit Queries* — Four audit queries were considered and covering sanction was granted for the payments mentioned therein.

(*h*) *Institution of the Rubber Industry* —Correspondence with the Institution of the Rubber Industry regarding the approval of the R.R.I. of Ceylon as a training centre for the diploma examinations of the Institution was tabled and it was noted that the Institute had been approved for this purpose.

5. EXPERIMENTAL COMMITTEE—

Mr. Dias' proposal that the Experimental Committee should meet regularly in future was passed.

6. S. H. COMMITTEE—

Mr. Dias' proposal that the Smallholdings Committee should meet regularly in future was passed.

7. TRAINING OF SUPERINTENDENTS AND ASST. SUPDTS.—

Mr. Dias' proposal that the R.R.I. should take in annually two or three youngsters as creepers for training as Superintendents or Asst. Superintendents of estates was agreed to in principle. It was agreed that a start should be made with two trainees and the Experimental Committee was asked to go into the matter and report on its practicability and implementation.

8. TECHNICAL MATTERS—

(*a*) *Conference of Scientific Officers of Rubber Research Institutes held at Bogor, Indonesia* — The Chemist's report dealing with the technological aspects of the Conference was approved.

(*b*) Director's memo on South American Leaf Disease — was approved.

9. ESTATE ITEMS—

(*a*) *School master* — It was agreed that the Singhalese School Master at Dartonfield be transferred to Hedigalla to take charge of the school which is being built there.

10. STAFF—

(*a*) *S. H. P. O.* — It was reported that Mr. W. I. Pieris, Smallholdings Propaganda Officer, had returned from leave and resumed duties on 1st October 1952.

(*b*) *Assistant Staff* — Changes in Asst. Staff were reported and approved.

(*c*) *Staff Club* — A copy of the rules of the Staff Club was tabled.

11. LONDON ADVISORY COMMITTEE—

Minutes of the 56th meetings of the Committee and the Technical Sub-Committee —were tabled. In connection with item 3 of the minutes of the Advisory Committee, the Chairman reported the receipt of a letter from the Chairman of the London Advisory Committee supporting the suggestion that the Director should pay a short visit to London to attend the meeting of the Agricultural Sub Committee to be held on 15th November 1952. It was agreed that the Director should attend this meeting.

12. PUBLICATIONS—

The following publications were tabled :

1. Report of the Work of The Rubber Research Board in 1951.
2. Combined 3rd and 4th Quarterly Circulars for 1951.
3. Advisory Circular No. 34 Tapping Systems.
4. do. No. 35 Notes on Rubber Seedling Nurseries.
5. do. No. 21 (Revised) The Control of Bark Rot and Canker.
6. do. No. 1 (Revised) Notes on Budgrafting Procedure.

The meeting then terminated.

Sgd. C. D. de FONSEKA,
Secretary-Accountant.

Dartonfield,
Agalawatta,
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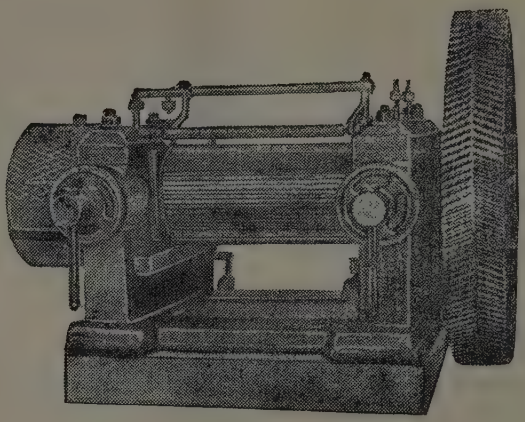

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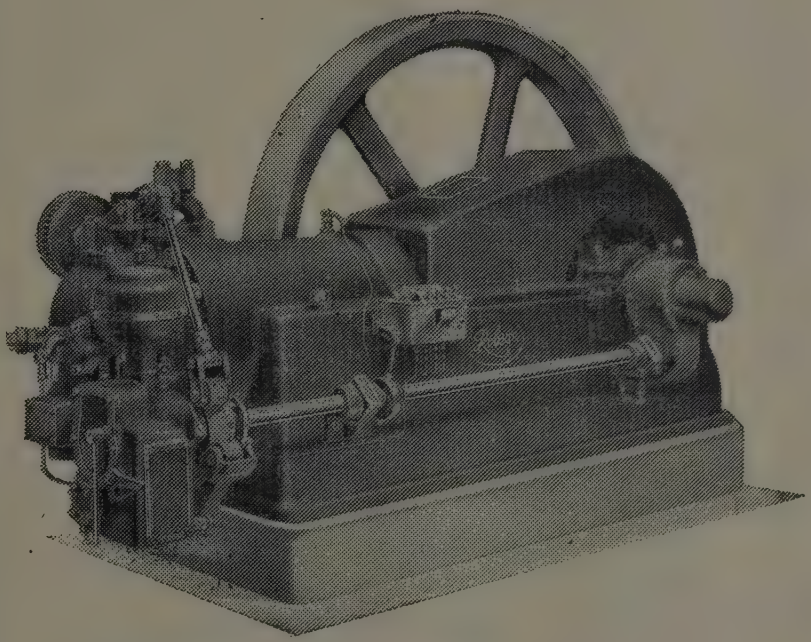

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NOTE: The Laboratories and Head Quarters Offices of the Institute are situated at Dartonfield Estate, Agalawatta. Telephone No. 26 Agalawatta. Telegraphic Address 'Rubrs' Agalawatta. There are two Experimental Stations, one at Nivitigalakele, Matugama and the other at Hedigalla, Latpandura. The office of the Smallholdings Dept. is at Eastern Bank Buildings, Fort, P. O. Box 901, Colombo. Telephone No. 2462, Colombo.

All enquiries and other communications should be addressed to the Director, Rubber Research Institute of Ceylon, Agalawatta.